



**Analysis of Indicators and Measurement Tools Used in Zambia to
Assess Impact of Agricultural Extension Programs on Gender
Equity and Nutrition Outcomes**

by

Rhoda Mofya-Mukuka and Mulako Kabisa

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December 2016

Indaba Agricultural Policy Research Institute (IAPRI)

Lusaka, Zambia

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The Indaba Agricultural Policy Research Institute is a non-profit company limited by guarantee and collaboratively works with public and private stakeholders. IAPRI exists to carry out agricultural policy research and outreach, serving the agricultural sector in Zambia, so as to contribute to sustainable pro-poor agricultural development.

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Any views expressed or remaining errors are solely the responsibility of the authors.

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EXECUTIVE SUMMARY

In Zambia, investment in agricultural extension with a focus on gender equity and nutrition outcomes has been increasing, and in the last decade, several organizations have replicated projects in different geographical areas. However, with persistent high prevalence of malnutrition and micronutrient deficiencies still being recorded especially among children below the age of five, it is either these initiatives have little impact on reducing malnutrition, they are not sufficient, the correct programs are not being implemented, and/or the methods used to measure the impact may be inappropriate.

Zambia is currently ranked one of the 30 countries with the highest rates of gender inequality. At the same time, child malnutrition is high with 40% of the children below the age of five suffering from stunted growth. The high rates of gender inequality in Zambia, coupled with the nutrition status of women and children, demonstrate the opportunity for improving gender equity and nutrition outcomes through agricultural interventions. Additionally, given available evidence that high levels of gender inequality are associated with higher levels of both acute and chronic under-nutrition (Ruel et al. 2015; Herforth and Harris 2014), addressing gender equity becomes one way of achieving projects' and ultimately the country's desired nutrition outcomes. Agricultural extension has proved useful for delivering gender and nutrition education among rural farming communities (MEAS 2013).

The primary objective of this study is to contribute to a better understanding of how to measure the impacts of agricultural extension services on nutrition and gender outcomes within the Zambian context. Specifically, the study:

- i. Discusses some agricultural extension interventions that exist or have existed in Zambia in the last five years with a primary focus on promoting gender equity and/or nutrition;
- ii. Examines measurement tools and indicators used to measure impact of the interventions on gender equity and nutrition; and
- iii. Discusses the challenges experienced by organizations in Zambia in applying specific measurement tools.

The study identified agricultural projects with significant components focused on gender equity and nutrition outcomes, and reviewed how the impact of their interventions on promoting gender equity and nutrition outcomes is measured. It included interviews with project managers and/or monitoring and evaluation staff for selected projects meeting stated criteria. In addition, the study reviewed project documents, especially the monitoring and evaluation plans and reports.

The following are the key findings of the study:

- i. Zambia has several local and international organizations implementing agricultural extension interventions with a primary focus on improving gender equity and nutrition among the rural communities. The Zambian Government-led Scaling Up Nutrition First 1000 Most Critical Days' program (SUN 1st 1000 MCDP) (2013 to 2018) and the United States Agency for International Development (USAID) led Feed the Future Program (FTF) (2012-2017) have, in the last five years, significantly contributed to increased investment in agricultural extension interventions to promote gender equity and nutrition.
- ii. Several impact measurement tools, some of which are internationally recognized, have been adopted by the projects. Some of these are the Women Empowerment in Agriculture Index (WEAI), Women Asset Ownership Index (WAOI), anthropometric indices, and dietary scores such as Individual Dietary Diversity Score (IDDS),

Minimum Dietary Diversity Score for Women (MDDS-W), Minimum Dietary Diversity Score for Children (MDDS-C), Minimum Acceptable Diet for Children (MAD-C), Food Consumption Score (FCS), and Household Hunger Scale (HHS).

- iii. For the WEAI, only a few organizations, mainly the FTF programs, are monitoring all the five components of the measurement tool, while the majority, by design of their projects, focus only on some sub-sections. In that case, it becomes difficult to quantitatively measure the level of women empowerment and gender parity in agriculture. None of the projects was applying the Abbreviated WEAI, which is a modification of the WEAI.
- iv. There is need to build capacity among the project staff, even those that are not part of the monitoring and evaluation teams, on understanding of the indicators and the respective tools used for monitoring implementation. This is important even where projects engage outside organizations to carry out impact monitoring and evaluation.
- v. Some projects are being implemented even without baseline studies, which makes it difficult to set targets and indicators for measuring impact.
- vi. A number of projects focus more attention to monitoring the activities of the projects while impact analysis is not emphasized. It is important that all indicators at all stages of the monitoring and evaluation process are monitored in order to explain why or how some target may or may not be achieved.

Going forward, there is an urgent need to build capacity on nutrition and gender impact assessment to enable project staff to not only understand measurement tools, but to apply them appropriately. In addition, there is need to develop a general monitoring and evaluation framework for Zambia to guide the use of indicators specifically intended for measuring the impact of agricultural interventions on gender and nutrition. Finally, coordination of measuring of impact among different organizations with similar interventions should be encouraged. The use of a general monitoring and evaluation framework should be coordinated potentially by the National Food and Nutrition Commission (NFNC).

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ACRONYMS AND ABBREVIATIONS

5DE	Five Domains of Empowerment
A4NH	Agriculture for Nutrition and Health
ACDI/VOCA	Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance
APMEP	Agriculture Productivity Market Enhancement Project
BCC	Behavior Change Communication
BMI	Body Mass Index
CAD	Community Agro Dealer
CASU	Conservation Agriculture Scaling Up
CRS	Catholic Relief Services
CSO	Central Statistical Office
DFID	Department for International Development
ELITE	Enhanced Livestock, Trade and Enterprise Project
EWAS	Empowering Women through Agricultural Support
FANTA	Food and Nutrition Technical Assistance Project
FAO	Food and Agriculture Organisation
FCS	Food Consumption Score
FHI	Family Health International
FTF	Feed the Future
GAAP	Gender, Agriculture and Assets Project
HDDS	Household Dietary Diversity Score
HHS	Household Hunger Score
IDDS	Individual Dietary Diversity Score
iDE	International Development Enterprise (iDE)
IFPRI	International Food Policy Research Institute
IITA	International Institute for Tropical Agriculture
ILASP	Integrated Livelihoods and Agribusiness Support Project
INGENAES	Integrating Gender and Nutrition within Agriculture Extension Services
IPRWEF	Integrated Poverty Reduction and Women Empowerment Programme
LCMS	Living Conditions Monitoring Survey
MAD-C	Minimum Adequate Diet for Children
MCDP	Most Critical Days Programme
MDD-W	Minimum Dietary Diversity for Women
MEAS	Modernizing Extension and Advisory Services
MoA	Ministry of Agriculture
MoH	Ministry of Health
MUAC	Mid-Upper Arm Circumference
NFNC	National Food and Nutrition Commission
N@C	Nutrition at the Centre
NGO	Non-Governmental Organisation
PAM	Program against Malnutrition
PROFIT Plus	Production Finance and Improved Technology
RAIN	Realigning Agriculture to Improve Nutrition
R4NH	Research Program on Agriculture for Nutrition and Health

SFAM	Smallholder Farmers' Agency and Leadership in Rural livelihoods
SHA	Self Help Africa
SNV	Stichting Nederlandse Vrijwilligers
SUN	Scaling Up Nutrition
UC Davis	University of California at Davis
USAID	United States Agency for International Development
WAOI	Women Asset Ownership Index
WEAI	Women Empowerment in Agriculture Index
WFP	World Food Programme
WHO	World Health Organization
ZDHS	Zambia Demographic Health Survey

1. BACKGROUND

1.1. Introduction

Since February 2016, IAPRI has partnered with the Integrating Gender and Nutrition within Agricultural Extension Services (INGENAES) Project, specifically with the consortium partner University of California at Davis (UC Davis), to explore the measurement tools used to monitor the impact of agricultural extension interventions on gender equity and nutrition outcomes. IAPRI's primary role is to contribute to a better understanding of how to measure the impacts of agricultural extension services on nutrition and gender outcomes within the Zambian context.

Zambia has a rank of 116 out of 145 countries worldwide in its gender gap index (World Economic Forum 2015). The Zambia Demographic Health Survey (ZDHS) report (CSO 2015), shows that only 35% of married women that earn cash income are able to independently make decisions on how to spend that income. The report also shows that about 10% of women aged 15 to 49 are underweight. According to the Feed the Future (FTF) baseline survey for Zambia, the country's women empowerment in agriculture index is 0.79, implying that 40.3% of the women are empowered (Feed the Future Feedback 2013)¹. Yet gender equity is not yet attained as women's control over and access to resources, household income and credit, among others factors, remains low. The gender inequality in Zambia, coupled with the nutrition status of women and children, provides an opportunity for improving gender equity and nutrition outcomes through agricultural interventions.

In addition, Zambia is ranked as the second worst country in the world and the worst in Africa in terms of food security status, with 48% of its population lacking adequate food provisions (FAO/IFAD/WFP 2014). This is in spite of the country generally producing a national surplus of staple foods successively (Chapoto et al. 2015). Currently, the global average of undernourishment is 11.3% and 23.8% in Africa, yet according to the 2016 Global Hunger Report, the Global Hunger Index for Zambia is 39%, which is among the three highest rates of hunger in Africa and in the world.

Malnutrition rates for children below the age of five have remained high in Zambia; with an estimated 40% of the children having stunted growth, 6% wasted and 15% underweight (CSO 2015). The majority of the rural households in Zambia consume mostly cereals and dark green vegetables (Figure 1).

Box 1. Definition of Terms

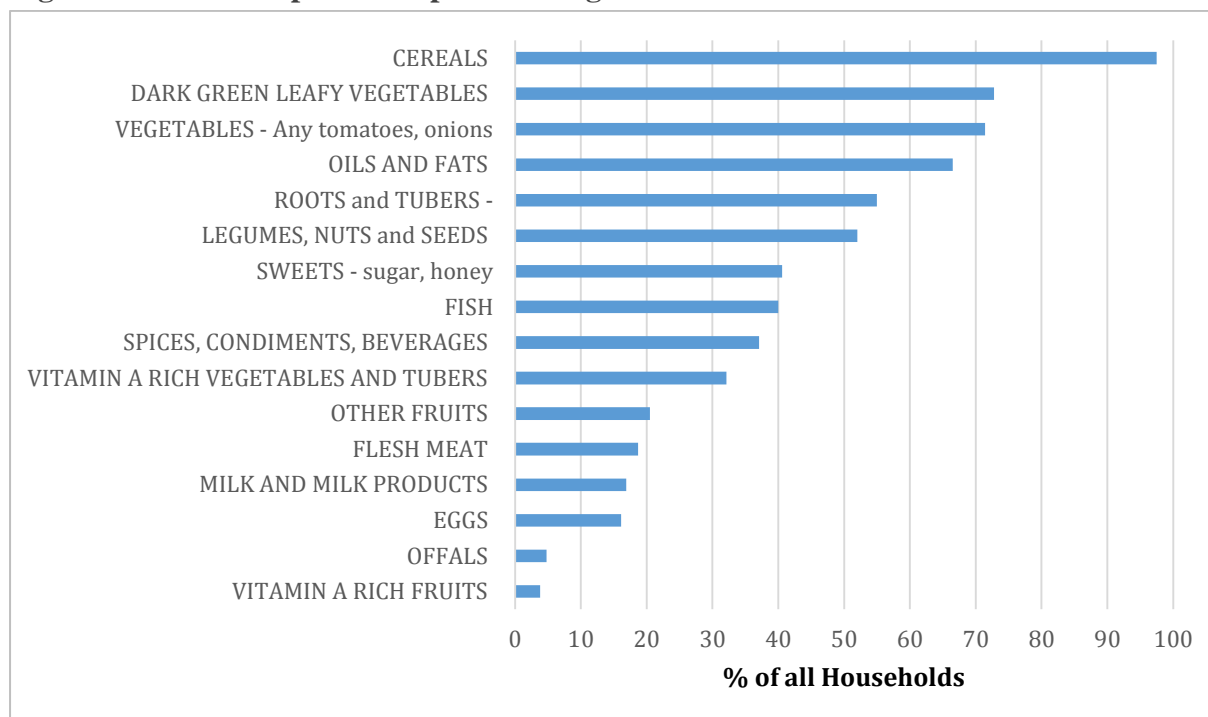
Indicator: "A quantitative or qualitative variable that provides reliable means to measure a particular phenomenon or attribute." (USAID 2009).

Survey/Measurement Tool: "Systematic collection of information from a defined population through interviews or questionnaires." (USAID 2009).

Measure: "An assessment of the size, amount, or degree of something, collected using an instrument or device marked in standard units." (Oxford 2009).

¹ Defined as a five domain of empowerment score (5DE score) of 80 percent or more.

Figure 1. Food Group Consumption among Rural Households in Zambia



Source: CSO/MoA/IAPRI 2015.

Currently, Zambia has both private and public, and local and international organizations delivering pluralistic agricultural extension messages on nutrition and gender. The Ministries of Agriculture (MoA), and Fisheries and Livestock play a key role in providing public extension services. The structure of the two ministries has district block and camp officers stationed in different zones of all the provinces in the country. However, the two Ministries face several challenges, not least being inadequate funding hindering effective extension services.² Zulu (2011) observed that effectiveness of extension staff was linked to incentives and institutional support, and in the face of poor conditions, staff lack motivation to carry out their work efficiently. Other than the two Ministries, the private sector and some non-governmental organizations (NGOs) provide extension services in the country.

In most cases the private sector and the NGOs work with the Ministries on various extension programs. Improving gender and nutrition outcomes using agricultural interventions will continue to be difficult if agricultural investment indicators are not linked to gender and nutrition outcomes during the planning stage (Herforth and Harris 2014).

Several measurement tools³ have been developed to monitor the impact of agricultural interventions on gender outcomes and improved nutrition.

Two recently developed measurement tools to assess intervention impacts on gender outcomes are the Women Empowerment in Agriculture Index (WEAI), Women Asset Ownership Index (WAOI). Common measurement tools used to assess dietary diversity and food access include the Dietary Diversity measurements Individual Dietary Diversity Score (IDDS), Minimum Dietary Diversity Score for Women (MDDS-W), Minimum Dietary Diversity Score for Children (MDDS-C), Minimum Acceptable Diet for Children (MAD-C),

² Until 2015, the two Ministries were one Ministry known as Ministry of Agriculture and Livestock.

³ In this study, a measurement tool is a collection of indicators used to monitor the level of impact of an intervention

Food Consumption Score (FCS), and Household Hunger Scale (HHS).. According to FAO (2010), HDDS is not meant to measure micronutrient adequacy of the diet but provide an indication of household economic access to food. Anthropometric measurements are indicative of the nutritional status of individuals in a population and they can be divided into those assessing children and those assessing adults. The indices used for children are the Weight for Height, Height for Age, Weight for Age and the Mid-Upper Arm Circumference (MUAC) and. Common measurements used for adults are the Body Mass Index (BMI) and MUAC.

With the implementation of the Government of Zambia's Scaling Up Nutrition (SUN) First 1000 Most Critical Days Project (1st 1000 MCDP) (2013-2018) and the USAID FTF program in Zambia (2012-2017), there has been increased investment on promoting gender equity and nutrition in the country in the last five years, aligned with increasing attention globally among projects to measure the impact of agricultural interventions on gender and nutrition outcomes. The FTF program in Zambia, which has six projects focusing on different aspects of addressing poverty and undernutrition through agriculture and gender equity interventions, has dedicated considerable amount of resources and time on measuring the impact of the interventions. Such programs are greatly expected to narrow the gap in the documentation of the impact of program interventions identified in literature (Olney et al. 2013). According to Olney et al. (2013), the gap in documenting impact of program interventions may primarily be due to inappropriately designed programs that have flawed targets, insufficient inputs, and poor implementation plans.

There is evidence that most program interventions seeking to have nutrition and gender outcomes regard the monitoring and analysis of process indicators, such as measurement of delivery services, as the proxy for impact evaluation (Shoham 2001). A focus on process indicators means the evaluation of an intervention's impact may not necessarily be reflective of a change in the target populations' status. Some practitioners argue that the most effective way to measure the impact of an intervention on nutrition is through food security and diet quality indicators (Ruel et al. 2015). Documenting impact is core for program interventions as they give context specific constraints that can be considered during implementation or design of future programs. Several measurement tools have been adopted and are being applied by different programs in different countries including Zambia, but whether these measurement tools are capturing the right information to measure the impact of agricultural extension on gender and nutrition in the context of Zambia is a question that this study seeks to explore.

Against this backdrop, the aim of this paper is to examine the measurement tools used in Zambia to assess the impact of agricultural extension on gender and nutrition outcomes. The specific objectives of the study are to:

- i. Discuss some agricultural extension interventions that exist or have existed in the last five years with primary focus on promoting gender equity and nutrition outcomes;
- ii. Examine how the impact of these interventions are, have been or are being measured;
- iii. Explore the measurement tools and indicators used in the Zambian context to measure the impact of interventions; and
- iv. Discuss the challenges faced by organizations when applying the specific measurement tools.

The study is guided by three research questions: i) Which agricultural extension interventions on gender and nutrition outcomes exist in Zambia? ii) What do the tools used to collect

intervention impact data measure? and iii) What are the main challenges faced by the organizations in measuring the impact of their interventions?

1.2. Agricultural Extension, Gender Equity, and Nutrition

Gender equity and improved nutrition are increasingly recognized as closely linked. Gender inequality, which involves uneven allocation of resources, decision-making, unequal treatment, or perception of an individual by virtue of being male or female, can contribute to imbalances in nutrition outcomes. Several studies have found women to be critical actors in agricultural households and communities for improved health and nutrition outcomes such that high levels of gender inequality are associated with higher levels of both acute and chronic under-nutrition (Herforth et al. 2016; FAO 2012; Antonopoulos and Floro 2005).

Two known direct causes of under-nutrition are disease and insufficient dietary intake (DFID 2009). Agricultural incomes can positively affect nutrition outcomes if the income realized is used to purchase nutritious food and improve aspects such as health, education, and sanitation that have an impact on nutrition (Herforth and Harris 2014). This implies that an increase in agricultural income does not necessarily lead to positive nutrition outcomes, especially if its expenditure is not directed towards items/activities that are not directly linked to improved nutrition. When appropriately used, access and control of agricultural incomes by women has shown a significant correlation with dietary diversity and height for age measures (Malapit et al. 2015). Women's improved access and control of agricultural incomes improves their status of empowerment, which in turn can lead to better nutritional status of their households because of their roles in childcare and household food preparation (Malapit and Quisumbing 2016).

However, women face several gender-based barriers. For instance, asset ownership remains a challenge for a large proportion of rural women farmers in Zambia. Given that assets are used as collateral for obtaining credit for farmers, women tend to be disadvantaged in credit markets. Data on asset ownership in Zambia shows that, apart from ox-ploughs and ox-carts, a higher proportion of men own productive assets compared to women (CSO/MoA/IAPRI 2015). According to Alkire et al. (2013), when women control additional income, their families enjoy better health, nutrition, and education. Therefore, removal of gender-based constraints can potentially make a substantial contribution to realizing economic development.

Further, evidence shows that households with higher involvement of women in decision making on agricultural activities and incomes have better nutrition outcomes (Johnson et al. 2016; Piesse and Simister 2003). According to FAO (2012), gender equity in agriculture is important not only for increasing agricultural productivity but for reducing hunger and achieving food security, such that if women received the same level of access as men to productive agriculture resources, yields can increase by 20-30%. Hence, by addressing gender inequality, there is a higher likelihood that nutrition outcomes can be improved.

Agricultural extension is increasingly being used as a vehicle for delivering gender-responsive programming and nutrition education among rural farming communities. According to MEAS Project (2013), successful agricultural extension should address three key issues; "i) facilitate access of farmers, their organizations and other market actors to knowledge, information and technologies; ii) facilitate their interaction with partners in research, education, agri-business, and other relevant institutions; and iii) assist them to develop their own technical, organizational and management skills and practices." A project

is said to be nutrition sensitive if its main functions are to improve nutrition in the target area by addressing factors that underlie good nutrition such as: a clean hygienic environment; access to diverse foods that are of good quality and quantity; and addressing issues pertaining to care of the individuals (mother, child or other household members) (Herforth et al. 2016).

The challenge in many African countries, Zambia inclusive, is that agricultural extension is generally skewed towards supporting male farmers (Saito and Weideman 1990). This is sometimes by design but often times by default. Saito and Weideman (1990) note that most times, agricultural services tend to be dominantly provided by male extension workers with an assumption that their messages will trickle down to the female farmers, which is not always the case. Agricultural extension in Zambia focuses largely on agricultural productivity, particularly on the staple crop, maize, rather than the production and use of more nutrient-dense crops, or crops that women have traditionally managed and often use in the households such as groundnuts or root crops including potato, sweet potato, and cassava.

2. DATA AND METHODS

This study applied qualitative methods to assess the indicators and measurement tools used by the organizations to measure the impact of agricultural extension programs on gender equity and nutrition outcomes. Interviews with project managers and/or their monitoring and evaluation specialists were conducted to collect information on interventions. Focus was on the measurement tools for assessing impact of the interventions.

Second, we reviewed available project documents to understand their designs and implementation. This review provided information on what the projects had intended to achieve in order to understand whether the right impacts were being measured. An estimated 75% of the public and private projects identified in the Terms of Reference as involved in developing monitoring and evaluation indicators for gender and nutrition outcomes were included in the study. These projects were being implemented by various organizations and institutions including government, development partners, and NGOs. The criteria of selection of these projects were if the project was implementing agricultural extension programs with a primary focus on those with indicators measuring gender equity and/or nutrition outcomes. Table 1 shows the organizations included in the study.

Initial results of the study were shared with the stakeholders, who were interviewed as well as others in the sector at a feedback workshop held on 28 June, 2016.

Table 1. Organizations Interviewed

Institution	Program
Government	Ministry of Agriculture, National Food and Nutrition Commission
Development Partners (Agriculture)	Food and Agriculture Organization of the United Nations, World Food Programme, Irish Aid, United States Agency for International Development, African Development Bank
Development Partners' Projects	Nutri-Aid Trust, International Development Enterprise
Non-Governmental organizations	Concern Worldwide, Catholic Relief Services, CARE International, World Vision, International Institute for Tropical Agriculture, World fish, Harvest Plus, Programme Against Malnutrition, Production, Finance, and Improved Technology Plus, Stichting Nederlandse Vrijwilligers, Heifer International

Source: Authors.

3. AGRICULTURAL EXTENSION PROJECTS WITH PRIMARY FOCUS ON GENDER AND NUTRITION OUTCOMES IN ZAMBIA

There are a number of projects implementing agricultural extension designed to have impacts on gender equity and nutrition outcomes in Zambia. These projects vary widely by size, funding, costs, and areas of coverage. The SUN 1st 1000 MCDP and the FTF programs have invested significant amount of resources in Zambia in the last five years and a number of their projects have been included in this study.

Several organizations and government ministries are implementing different interventions under the SUN 1st 1000 MCDP. The NFNC provides an oversight of the implementation of the program in Zambia. The SUN 1st 1000 MCDP takes a holistic approach by addressing the underlying multi-sectoral factors of nutrition, which includes promoting gender equality in different parts of the country. The program has five strategic areas implemented by different line Ministries. The MoA, International Institute for Tropical Agriculture (IITA), Care International, and World Food Programme (WFP) are some of the organizations included in this study, which are implementing agricultural extension programs under SUN 1st 1000 MCDP. The agricultural component of the SUN 1st 1000 MCDP primarily focuses on providing agriculture and nutrition education.

The main objective of the SUN 1st1000 MCDP is to assess a woman's diet from the time she conceives through to when the child is born and attains age of two. The program is tailored towards strengthening and scaling up 14 selected priority interventions from different evidence to address stunting and maternal under-nutrition.

The SUN 1st 1000 MCDP operates in five strategic areas: 1) policy and coordination; 2) priority sectoral interventions to reduce stunting; 3) institutional, organizational, and human resource capacity building; 4) communication and advocacy; and 5) monitoring, evaluation, and research.

The MoA is one of the ministries implementing the SUN 1st 1000 MCDP. It focuses on increasing food availability to reduce malnutrition particularly for women and infants. This is done through three areas: i) empowering women through provision of small livestock; ii) promoting nutrient-dense foods like bio-fortified crop products fruits, vegetables, legumes, orange maize and orange-fleshed sweet potato; and iii) food processing including plant and animal products.

IITA in Zambia is also implementing the SUN 1st 1000 MCDP. The aim is to integrate agriculture to promote nutrition focusing on all crops and trees that are nutritious. IITA carries out agricultural research to promote nutrition. A program running from 2015 to 2016 focused on research on the relationship between aflatoxin and stunting. The program includes training of trainers on nutrition.

The National Food and Nutrition Commission, a statutory body of Government located in the Ministry of Health, plays a key role in coordinating the implementation of nutrition activities in the country. Its role includes providing advice to Government and other stakeholders on the extent of malnutrition and food insecurity and how to address it. It also facilitates nutrition training, and develops and distributes nutrition information. The coordination of the measurement of indicators, therefore, becomes key for NFNC to be able to effectively carry out its mandate. The Zambia Feed the Future Initiative is implemented in the *Zone of Influence* of Eastern Province through several projects covering five districts. These projects focus on agricultural growth and improved nutritional status.

The highest-level nutrition target is to reduce stunting of children under the age of five by 20% in the focus area (FTF Feedback 2013). The FTF program in Zambia has nine projects focusing on different aspects that contribute to growth of the agricultural sector and improvements in the nutrition status. This study included four projects that have primary focus of promoting gender equity and nutrition. The four projects are: the Mawa project implemented by the Catholic Relief Services (CRS); HarvestPlus; Production, Finance, and Improved Technology Plus (Profit Plus) implemented by Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance (ACDI/VOCA); and the Zambia Agriculture Research and Development Project implemented by IITA. Table 2 gives a list of projects covered in this study.

Table 2. List of Projects and their Implementers

Project	Implementing Organization
Realigning Agriculture to Improve Nutrition	Concern Worldwide Zambia
Agriculture and Nutrition for Health	Concern Worldwide Zambia
Mawa Project (Feed the Future project)	Catholic Relief Services
Sustainable Nutrition for All (Swiss Agency for Development Agency)	Stichting Nederlandse Vrijwilligers
Production, Finance, and Improved Technology Plus (Feed the Future Project)	Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance
Nutri-AID Trust	Nutri-AID Trust
Nutrition at the Centre	Care International Zambia
Empowering Women through Agriculture Support project	Programme Against Malnutrition
Feed the Future HarvestPlus (and other funding sources)	International Centre for Tropical Agriculture and the International Food Policy Research Institute
Research Program on Agriculture for Nutrition and Health	International Institute for Tropical Agriculture and the International Food Policy Research Institute
Enhanced Livestock, Trade and Enterprise	Heifer International under the Self Help Africa Send A Cow program
Integrated Livelihoods and Agribusiness Support Project	Heifer International
Scaling Up Nutrition: The First 1000 Most Critical Days Programme	Ministry of Agriculture, International Institute for Tropical Agriculture, World Food Programme: Mumbwa programme
Agriculture Productivity Market Enhancement Programme	Ministry of Agriculture
Conservation Agriculture Scaling Up	Ministry of Agriculture
The National Food and Nutrition Commission	Ministry of Health
International Development Enterprise	International Development Enterprise

Source: Authors.

All the projects interviewed, apart from the NFNC that specifically deals with nutrition, had both gender and nutrition interventions in their plan of activities. They differed in the aspects on gender and nutrition outcomes being advocated and this will be discussed in the next sub section. The decisions on the nature of the intervention, its objective, its timeframe, the targets and implementation are essential in selection of measurement measurements (Mofya-Mukuka and Kuhlitz 2015).

A brief discussion of the projects is given hereunder. For each project, the paper gives the implementer of the project, the objectives, and the intervention approach used.

3.1. Realigning Agriculture to Improve Nutrition (RAIN)

Implementer: Concern Worldwide Zambia in partnership with IFPRI

Objectives: To develop a sustainable model to integrate and realign agriculture and nutrition/health interventions for effective prevention of childhood and maternal under-nutrition in rural setups, and built in an explicit research project to test and identify pathways from agriculture and nutrition interventions for nutrition outcomes.

Approach Used: The project's agricultural interventions focused on homestead gardening (agricultural diversity) and small-scale animal husbandry (goats and chickens). The main approach centered on addressing the multi-sectoral causes of malnutrition. The project has a District Nutrition Coordinating Committee that includes representatives from the Ministry of Agriculture and Livestock, Ministry of Health and from civil society. Its purpose is to establish coordination mechanisms to help align activities by stakeholders towards addressing malnutrition by promoting coordination at district level and trickling down to extension workers at community level (Concern Worldwide 2012). At the time of this study, the project had completed an endline study to be analyzed by IFPRI for impact. First results of the impact analysis have been released and reflect a high standard of impact analysis for agricultural project evaluation.⁴

3.2. Agriculture for Nutrition and Health (A4NH)

Implementer: Bioversity International

Objectives: This project is primarily a research project aimed at improving food and nutrition security all year round through identifying dietary patterns and nutritional gaps across the seasons.

Approach Used: It had a *whole diet-whole year* approach addressing multiple dietary deficiencies rather than focusing on a single nutrition problem through supplementation (IFPRI 2016).

3.3. Mawa Project

Implementer: Mawa is one of the FTF projects implemented by the Catholic Relief Services (CRS).

⁴ Harris, J. et al. RAIN Project Impact Evaluation Report. IFPRI and Concern Worldwide 2015

Objective: It operated in the Eastern Province with the aim of assisting smallholder farmer households with strengthening and diversifying agriculture production, engagement with markets, and improving nutrition

Approach Used: The project had three components:

- i) Conservation agriculture: This was in collaboration with Golden Valley Agricultural Research Trust. CRS provided agriculture extension and advisory services on conservation agriculture through demonstration plots.
- ii) Nutrition: The project used nutrition volunteers to offer complementary feeding and learning sessions to households with pregnant or lactating women and children under 2 years of age to prevent malnutrition. These sessions included lessons on proper processing, preparation and preservation of diverse and nutritious foods.
- iii) Savings: Smallholder farmers are equipped with skills to support the transition from subsistence farming to production for markets. The skills provided include:
 - savings and lending skills;
 - group management skills for collective activities planning;
 - business and marketing skills to help in organizing the production processes to meet market demand;
 - natural resource management skills for protection and sustainability of natural resources; and
 - innovations to adapt to change and manage risks.

3.4. Sustainable Nutrition for All (SN4A)

Implementer: Stichting Nederlandse Vrijwilligers (SNV)

Objective: The main aim is to provide awareness on the importance of good nutrition, helping local communities to generate demand for dietary diversity and improve intra-household gender interactions.

Approach Used: The project is generating the evidence base to support the development of policies that support nutrition interventions, including increasing household agro-biodiversity, conducting Behavior Change Communication (BCC) campaigns, and providing nutrition education in schools (SNV 2016a). The project has developed district coordinating committees and sub-district committees with an objective of working with multiple local organisations for improved nutrition.. This approach has four components:

Triggering demand for intra household dietary diversity:

- Behavioral change at intra household level. This is achieved through behavioral motivator research and gender analysis. The results are included in the behavioral change campaigns, which are also conducted in schools.
- Strengthening nutrition sensitive agricultural production. To achieve this, the project has several activities including establishment of nutrition hubs, post-harvest training, and community seed banks and promoting market linkages.
- National governance for intra household dietary diversity and improved nutrition. This component includes establishment of multi-stakeholder coordination through innovation platforms, developing nutrition standards, and creating gender awareness.

3.5. PROFIT Plus

Implementer: ACDI/VOCA

Objective: The project targets smallholder farmers in eastern Zambia and some targeted value chains in peri-urban Lusaka. The objectives included boosting private investment in agriculture and improving women's participation in agriculture and trade (PROFIT Plus 2015).

Approach Used: The approaches used to achieve this are:

- i) Farmer Field Schools, which use a field level cascade approach with a knowledgeable, active farmer chosen by the community. The key interest is measuring plant development, taking samples of pests, weeds, and diseases and comparing characteristics of different soils over one cropping season and based on the findings, farmers make intelligent choices after plenary discussions.
- ii) Community Agro Dealer (CAD) Model, which is a similar approach to the farmer field school; it is centered on community agro dealers being an interface for farmers and input suppliers. An agro dealer builds their own shop, sells on behalf of an input supplier, and gets a commission. The agro dealers develop sellable business tact such as advising farmers to get the right input as opposed to recycling. The buyers to advise the farmers through agro dealers on which crop to produce thus creating market for produce of the season ahead. The project has a gender strategy and up to 30% of the CADs are women.
- iii) Savings and loan groups.

3.6. Nutrition at the Centre (N@C)

Implementer: Care International Zambia

Objective: The project seeks to reduce malnutrition in Lundazi and Chadiza districts.

Approach Used: An integrated approach with focus on five key areas;

- Infant and Young Child Feeding
- Maternal Health and Nutrition
- Food Security
- Water Sanitation and Hygiene
- Women's Empowerment

The goal of the project is to significantly decreasing stunting in young children and to decrease maternal and child anemia in resource poor areas. The project also explores women's empowerment as a tool to address malnutrition.

3.7. Empowering Women through Agriculture Support (EWAS) project

Implementer: Programme Against Malnutrition (PAM)

Objective: Implemented to two districts in Western and Southern provinces, the EWAS project aims to improve female farmers' livelihoods through increased incomes and resilience to the effects of climate change.

Approach Used: The project has 3 key components:

- i. **Climate Smart Agriculture and Food Security:** the Climate Smart Agriculture program promotes cultivation of drought resistant and nutritious crop varieties such as orange maize, which has comparatively higher nutritional value than white maize. The project promotes horticulture production and innovations such as the construction of clay stoves with twigs for household food preparation.
- ii. **Gender and Nutrition:** The EWAS project in collaboration with Non-Governmental Organizations Coordinating Council and Zambia Land Alliance helps to facilitate land ownership titles by enabling women to have offer letters from chiefs.
- iii. **Incomes and Livelihoods by scaling home gardens:** This component is meant to enhance women's economic empowerment by targeting rural women to help them produce crops for sale and home consumption.

The project collaborates with Community Markets for Conservation, local districts, and Conservation Farming Unit to build capacity on processing crops to enable value addition, hence, increasing market access and sales.

3.8. Disseminating Provitamin A Maize

Implementer: HarvestPlus

Objectives: The mission for HarvestPlus is to improve nutrition and public health by developing and promoting bio-fortified food crops that are rich in micronutrients. They also provide global leadership on bio-fortification evidence and technology.

Approach Used: In Zambia, HarvestPlus has focused on the promotion of highly nutritious food crops through bio-fortification, with key interest in vitamin A, which has been identified by World Health Organization as deficient. A baseline study carried out by HarvestPlus in Zambia showed that 54% of the population suffered from Vitamin A deficiency. Zambia's staple crop - maize, which is widely consumed and has been improved to orange maize with increased amount of vitamin A, is among the crops promoted by HarvestPlus. They collaborate with millers to process it into a fine mealie meal called breakfast mealie meal and a darker whole grain mealie meal called roller meal that is then packaged and sold.

3.9. Integrated Livelihoods and Agribusiness Support Project (ILASP) and Enhanced Livestock, Trade and Enterprise (ELITE) Project

Implementer: Heifer International, Self Help Africa (SHA), and Send a Cow

Objectives: The aim of the ILASP project is to improve the livelihoods of households that are vulnerable through women-led farmer groups found in Central Province and the aim of the ELITE project is to promote the use of sustainable agricultural practices and strengthen the value chain of livestock such as goats.

Approach Used: The ILASP project does this through promoting improved gender relations and agriculture enterprises in dairy production. The target households are provided with dairy cattle and pasture seedlings for establishing fodder banks for pasture. Once established these families will then pass on the first offspring of their animals and the skills and knowledge they acquired to other members of the community. The beneficiaries receive training on value addition of the dairy chain and the women led groups are strengthened in the aim to link them to various stakeholders for marketing and input access.

The ELITE project improves stakeholder coordination and access to market information for small livestock producers.

3.10. Agriculture Productivity Market Enhancement Project (APMEP)

Implementer: Ministry of Agriculture

Objectives: APMEP aims to contribute towards the increase of poverty reduction efforts and economic growth by ensuring the program beneficiaries achieve food and nutrition security and are able to earn an income.

Approach Used: The program has three components: agricultural production and productivity; value addition and market linkages; and institutional strengthening. Each of these components has sub-components addressing various issues. The agriculture production and productivity component has crop intensification and diversification, irrigation, and livestock development under it. The value chain development and market linkages has the themes market linkages and agro-processing infrastructure under it and the institutional strengthening category has the nutrition security and capacity building and project monitoring, management and evaluation themes.

At the time of this study, the project was still establishing itself in the six areas and a baseline study was in the process of being initiated.

3.11. Conservation Agriculture Scaling Up (CASU)

Implementer: Ministry of Agriculture

Objectives: This program is targeted at increasing crop production for over 315,000 Smallholder Farmers (SHF) in nine provinces of Zambia (except Northern Province) by promoting conservation agriculture practices.

Approach Used: The project is promoting cultivation of crops commonly referred to as *female crops* e.g., beans, cowpeas, Bambara nuts etc. The measures employed are monitored by community members. The knowledge is imparted routinely through Food and Agriculture Organisation's (FAO's) short message service (SMS) system that links farmers through message broadcast, thus, sending similar message at once to all SHFs.

Initially, the program concept did not cover the gender aspects of the SHFs, but is currently encouraging women farmers to improve food production through safe methods of agricultural practices.

4. REVIEW OF MEASUREMENT TOOLS USED IN MONITORING IMPACT OF AGRICULTURAL EXTENSION ON NUTRITION

This section discusses how the impacts of project interventions on nutrition of agricultural extension interventions outcomes are measured by the projects. The projects included in this section are those that focus on nutrition outcomes. These include RAIN, N@C, SUN 1st 1000 Most Critical Days' Programme, APMEP, Mawa Project, IPRWEP, Harvest-Plus micronutrient promotion project, and EWAS. Table 3 shows the projects interviewed and the measurement tools used to track the impact on nutrition (a full list of the indicators and the projects using those indicators is available in Annex 1). Three nutrition related outcomes are discussed:

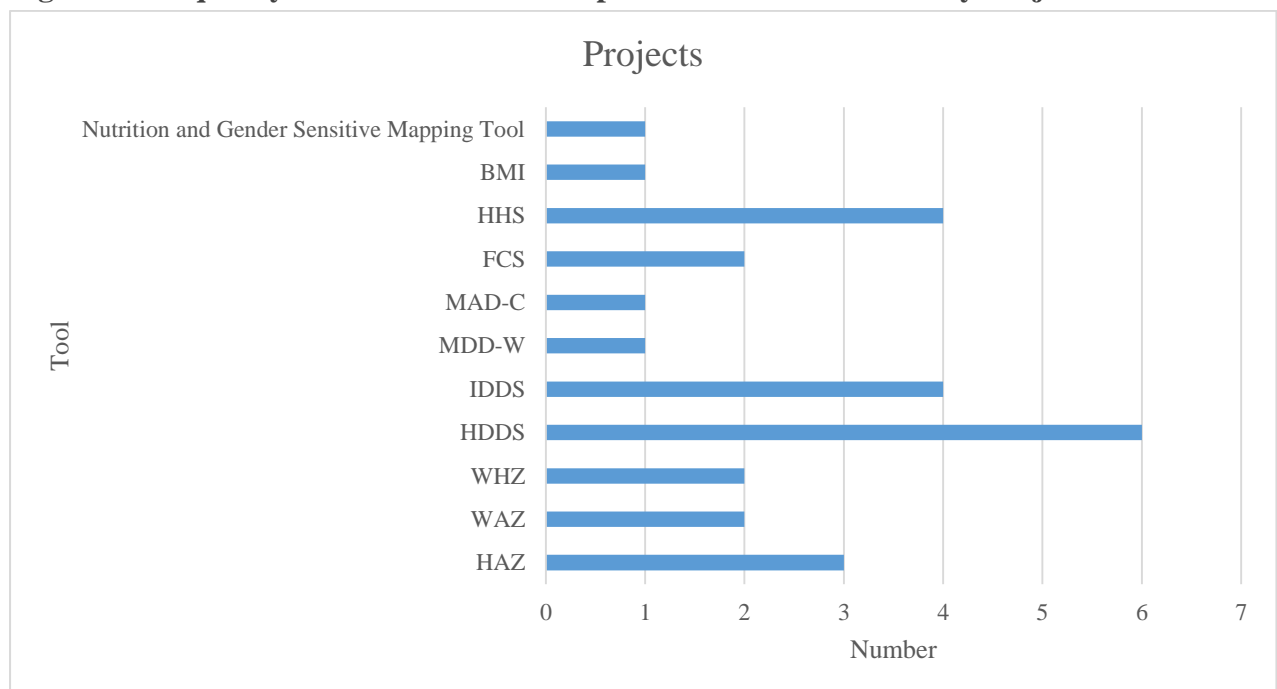
- i. Dietary Diversity;
- ii. Household Food Security; and
- iii. Anthropometric measurements.

Figure 2 shows the different measurement tools used to assess related nutrition outcomes and the number of projects using them. Details about the nutrition indicators and the projects are presented in ANNEX 1.

4.1. Measuring Dietary Diversity

The most common outcomes monitored by most projects were dietary diversity and access to diverse and nutritious foods using measurements such as IDDS, HHS, and the HDDS. Dietary diversity refers to the total amount of foods or food groups consumed within a specified reference period (FANTA 2006). Indicators that are commonly used to measure the diversity of an individual diet are the MDD-W, Individual Dietary Diversity Score IDDS, and the MAD-C.

Figure 2. Frequency of Use of Nutrition Impact Measurement Tools by Projects



Source: Authors presentation based on interviews with projects.

A dietary diversity study by the World Health Organization (WHO) 2010a), in 10 developing countries, suggests that children 6 to 23 months who consumed at least four of seven food groups the previous day have a high likelihood of consuming at least one animal-source, one fruit or vegetable, and a staple. This means that childhood dietary diversity scores serve as a proxy measure for micronutrient adequacy, and are appropriate for measuring changes in dietary quality. HDDS provides an indication of a household's access to diverse foods, which is also commonly measured among the projects (Box 2).

The IDDS and MDD-W are similar to the HDDS. The differences are that:

- i. While the IDDS and the MDD-W serve as proxy measures for the micronutrient intake of individuals, the HDDS is an indication of household access to diverse nutritious foods.
- ii. The IDDS and the MDD-W includes consumption of all food by a household member regardless of the source (whether produced or prepared in the household or purchased or given outside of the household) while the HDDS only includes produced or purchased by the household.
- iii. The MDD-W includes consumption of 5 or more of the 10 food groups while the HDDS has no threshold to what the minimum number of food groups should be consumed (FAO and FHI 360 2016; FANTA 2008)
- iv. The IDDS has a total of 14 food groups while the HDDS has 12 food groups (FANTA 2008)

Box 2. Measuring Tools for Dietary Diversity

Household Dietary Diversity Score: The HDDS assesses the ability of a household to access food and categorizes it into 12 food groups for analysis (FAO 2012). Analysis of the data collected is known to be straight forward (Kennedy, Ballard, and Dop 2013). It is used by projects such as IPRWEP, EWAS, N@C, and 1st 1000 MCDP. Both the HDDS and Food Consumption Score (FCS) can help measure food access and consumption patterns at a population level. Scores however can also be used for regional or national level early warning systems to employ an intervention.

Minimum Dietary Diversity for Women (MDD-W): This is a proxy indicator used to measure the likelihood of adequate intake of 11 micro-nutrients by women aged 15 to 49 years over a recall period of 24 hours (FAO and FHI 360 2016). Several projects such as the 1st 1000 MCDP, RAIN, N@C, and EWAS collect data that measures micronutrient adequacy in women. It can be used at various levels including for larger populations (FAO and FHI 360 2016).

Minimum Acceptable Diet for Children (MAD-C): The MAD-C measures the proportion of children aged 6 to 23 months that had both minimum feeding frequency (four or more feedings) and minimum dietary diversity (four or more food groups) the day prior to the interview (FANTA 2008). Projects such as Mawa, RAIN, 1st 1000 MCDP, and N@C use this measure to assess dietary adequacy in children.

Source: Authors.

4.2. Measuring Household Food Security

4.2.1. Household Hunger Scale (HHS)

The HHS is used to measure hunger in food insecure areas. The Mawa project is one of the organizations that uses this tool. It is a food deprivation scale made to be used in developing countries (Ballard et al. 2011). It is able to capture data on extreme cases of food insufficiency (Maxwell 2013).

4.2.2. Food Consumption Score (FCS)

FCS is based on the diversity of the diet and frequency of food consumption. It is used as a measure for food security (Maxwell, Coates, and Vaitla 2013). It is computed from total scores based on the sum of frequency data from multiplying the number of times a food item is consumed in a seven day period and its standard weighted value (pre-determined and based on nutrient value) (WFP 2008).

Table 3 shows the indicators and the measurement tools used by different projects to monitor dietary diversity and household food access.

4.3. Anthropometric Indices

Anthropometric indices can be divided between those for children and those for adults. They are considered effective in assessing clinical nutritional status (Padilha et al. 2009). The measure of severity of malnutrition explained by anthropometric indices in form of Z-scores is explained in Box 3. Projects such as RAIN, Profit Plus, and the 1st 1000 MCDP use anthropometric measures to assess their impact on nutrition outcomes.

Table 3. Dietary Diversity Indicators and Household Food Access Measurement Tools

Indicators	Tool	Project
- % target households producing micronutrient rich plant and animal foods	Household Dietary Diversity Score, Individual Dietary Diversity Score, Women's Dietary Diversity Score, Food Consumption Score, Household Hunger Scale and Minimum Adequate Diet for Children	Realigning Agriculture to Improve Nutrition Project
- Captured figures of the targeted pregnant and lactating women consuming at least 6 out of 9 recommended food groups		Harvest Plus
- Prevalence of households with moderate or severe hunger		Integrated Poverty Reduction and Women Empowerment Programme
- Proportion of children 6-23 months having both minimum dietary diversity and minimum meal frequency		Scaling Up Nutrition: First 1000 Most Critical Days Program
- # of women with children < 2 years eating from 4 or more food groups during the previous 24 hours		Mawa Project
- # of Households (women, men) that have improved dietary diversity		Nutrition at the Centre
		Sustainable Nutrition for All Agriculture Productivity Market Enhancement Programme

Source: Authors.

Box 3. Anthropometric Measures Z-scores

- Z-scores of below -2 standard deviations (SD) shows that the child has low weight for age, height for age or weight for height.
- Z-scores below -3 SD of the reference population shows that the child is severely undernourished.

Source: WHO 2010a.

The WHO (2006) Child Growth Standards and the National Landscape Information System (NILS) interpretative guide (WHO 2010b) provide detailed anthropometric standards that are used to assess nutritional status in children. These indices are summarized as follows:

4.3.1. *Weight-for-Height*

This index measures the weight-for-height in children and is used to measure wasting. Wasting is symptomatic of acute undernutrition due to high disease prevalence incidents and/or insufficient nutrient intake. It refers to a child having a low weight for their height.

4.3.2. *Weight-for-Age*

This index measures the weight-for-age and is used to measure underweight as a result of both chronic and acute malnutrition. Underweight refers to a child having low weight for their age.

4.3.3. *Height-for-Age*

This index is used to measure stunting which refers to failure to reach linear growth potential. It is indicative of the effects of chronic illness and insufficient nutrient intake on a child both before and after birth.

A summary of the cut-offs⁵ for these anthropometric measures can be summarized as follows:

4.3.4. *Body Mass Index*

This index measures the status of being underweight, overweight, or obese in adults. It is calculated by taking an individual's weight in kilograms and dividing by the square of the height in meters (WHO 2006). BMI values of less than 17 indicate extreme thinness; below 18.5 indicate underweight; between 18.5 and 24.9 show the normal range; over 25 indicate being overweight; and above 30 indicate obesity

⁵ The Z-score system is the anthropometric value showing the number of standard deviations or Z-scores below or above the reference mean or median value of a particular population (WHO 2010a)

5. REVIEW OF MEASUREMENT TOOLS USED IN MONITORING IMPACT OF AGRICULTURAL EXTENSION ON GENDER EQUITY

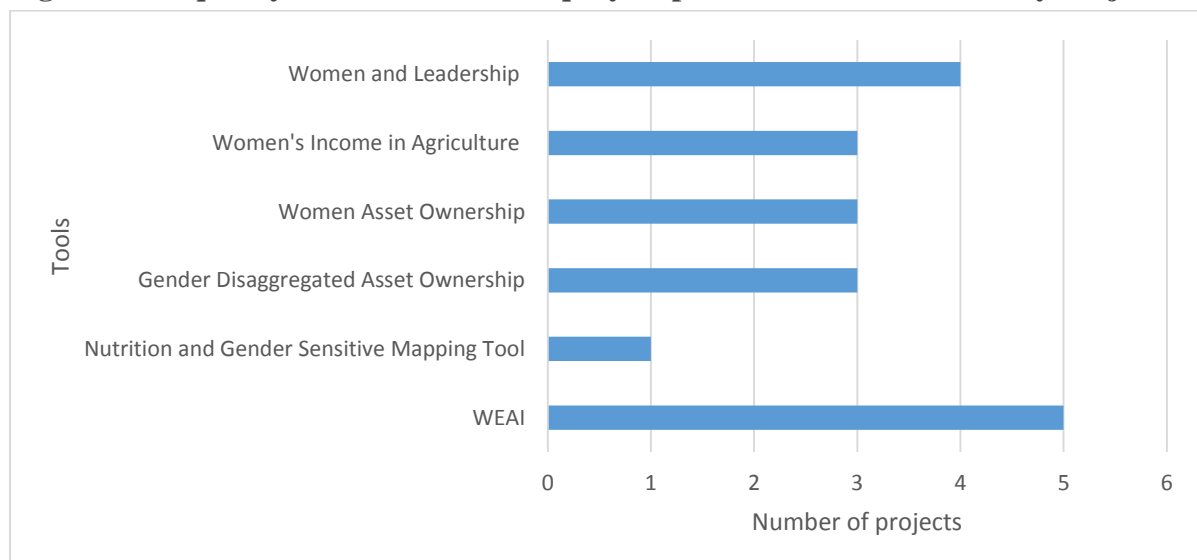
Some of the most widely used outcome indicators for measuring gender equality (for this discussion the focus is on men and women in agricultural households) include: women/men-managed/earned income; sex-disaggregated yields; and sex-disaggregated technology adoption measurements.

Gender disparities world-over have been identified among causes of maternal and child under-nutrition. Women contribute about 60 – 80% of food production in sub-Saharan Africa that is used for income generation and household consumption (FAO 1996). In Zambia, 78% of women are engaged in agriculture compared to 69% of men (Sitko et al. 2011). A report by the Central Statistical Office (CSO) on the status quo of health and women empowerment indicates that: 89% of men have input in decision making about household health, whereas only 74% of women have input on the same; only 49% of women whose husbands earn cash make joint decisions with their husbands on how household income is spent; and only 35% of married women earning their own cash are able to make independent decisions about how to spend it (CSO 2015). Generally, women face more severe constraints in improving agriculture production than men (due to labour, time and credit constraints), and therefore there is a need for accurate indicators to measure women empowerment in agriculture (Stern, Jones-Renaud, and Hillesland 2016).

PROFIT Plus, EWAS, ELITE, ILASP, the RAIN project, ISRM, SN4A and Smallholder Farmers' Agency and Leadership in Rural livelihoods (SFAM) are the projects that are carrying out interventions on promoting gender equity. The main evaluation measurement tools from the indicators used show that the projects are using some sub-components of the WEAI and Gender-disaggregated Assets Ownership. Figure 3 shows the gender impact measurement tools used by different organizations. Details of the specific indicators for the measurement tools are presented in Annex 2.

The WEAI is discussed in detail by Alkire et al. 2013; Malapit and Quisumbing 2016; Stern, Jones-Renaud, and Hillesland 2016.

Figure 3. Frequency of Use of Gender Equity Impact Measurement Tools by Project



Source: Authors presentation based on interviews with the projects.

Note: For some measurement tools, only sub-sections of the indicators are collected.

Box 4. Five Domains of Empowerment

According to Malapit et al. 2014, the 5DE measured in the WEAI are:

- i. Women's input over productive decisions and autonomy;
- ii. Resources relating to women's ownership of productive assets;
- iii. Women's control of household income use;
- iv. Women's leisure time and workload; and
- v. Women's membership in groups and community leadership.

Source: Authors

5.1. Women's Empowerment in Agriculture Index (WEAI)

The Women's Empowerment in Agriculture Index (WEAI) attempts to measure how women fare in five domains of empowerment (5DE) within the agricultural sector with a gender parity index (IFPRI 2012; Malapit et al. 2014; Stern, Jones-Renaud, and Hillesland 2016; Feed the Future 2016) (See Box 4).

Indicators such as the number of women with equitable control over family income, average number of assets owned by category and average household incomes are used by various projects. These indicators are part of the WEAI domains. Important interventions that agricultural projects can implement to meet women empowerment and income objectives include providing equitable access to resources, knowledge, and agricultural income (Herforth et al. 2016). The measurement tools and indicators also capture the information on household incomes and asset bases that households possess.

PROFIT Plus is one of the Feed the Future projects that is working in the area where the WEAI is being applied at population level. The project has focused on one dimension of empowerment: leadership. About a third of the women involved in the project have obtained leadership positions, and many more have gained access to extension services (through leadership positions) and are building their own shops to gain income. Around 100 women have become input suppliers showing the impact has promises of long-term sustainability. Other projects use sub components of the WEAI looking at dimensions such as time allocation, decision-making, leadership within the communities etc. Examples of such projects include EWAS, APMEP, ILASP, and A4NH. So far, none of the projects was using Abbreviated WEAI (A-WEAI), a modification of the WEAI. It should be noted that all the projects were being implemented at sub-regional level, which makes it impossible to collect data from a large sample to calculate the A-WEAI.

The measurement tools being used by the organizations interviewed have several limitations. The first is that most of the organizations are not including men in their studies on gender equity. The WEAI is one exception. For a holistic picture of constraints faced by women in terms of empowerment and income, it is necessary to understand what is going on with the men in order to understand constraints that are unique to the women and in order to address them appropriately. This can also help in addressing the widely held perception in the public domain that gender equity is a *women's issue* and not one that affects both men and women (Dlamini and Samboko 2016). Another aspect lacking in the measurement tools is the lack of information on sex-disaggregated asset ownership. It is essential that asset ownership is included in interventions trying to empower women.

Ideally, measurement tools employed to measure gender and income impacts by interventions should be used as they are designed to be applied. When used in part, they may not be accurately measuring the outcome as intended. Asset ownership and gender relationships are complex and belonging to a household having a certain amount of assets or income does not necessarily translate into the adults (male and female) having equitable access and decision-making power over them (Doss, Grown, and Deere 2008).

The use of sub-sections of measurement tools, such as one of the domains of the WEAI, might be carried out depending on the intervention. According to Malapit et al. (2014), the complete use of these measurement tools may be resource intensive and may have components (e.g., autonomy in production and speaking in public) that are considered sensitive or difficult to understand when administering the questionnaire. For this reason, it may be necessary, depending on the cultural context of the project area, to only use parts of the instruments that will get responses on gender and income.

5.2. Gender Disaggregated Asset Ownership

Gender, Agriculture and Assets Project (GAAP) developed useful methodologies in measuring men and women's asset ownership and use in the context of developing countries (Quisumbing et al. 2013). The GAAP methodology has a toolkit that gives guidance on collecting gender and assets data in research that is qualitative and quantitative. The best practices in data collection, as outlined by Behrman et al. (2014), include issues such as the need to understand context-specific inheritance patterns and how they influence asset ownership, as well as defining ownership and different types of rights within the cultural contexts of the research areas.

5.3. Women Asset Ownership and Income (WAOI)

Literature suggests that asset ownership is usually measured at household level without considering gender information and the category of assets is limited (Behrman et al. 2014). The neglect of individual level assessment leaves out the potential to investigate differences of ownership and decision making on assets between men and women within a household (Antonopoulos and Floro 2005). The ownership of assets is linked to the ability of an individual to access credit and insures them against various shocks (Hulme and McKay 2005). Allowing gender analysis with information captured at individual, rather than household level, can make it possible to see how factors such as vulnerability and poverty interact with asset ownership across gender (World Bank 2008). Projects such as EWAS, SFAM, Profit Plus and ELITE all use indicators that measure their impact on asset ownership by women.

5.4. Nutrition and Gender Sensitive Agriculture Mapping Toolkit

This toolkit was developed by the Royal Tropical Institute and SNV and is used by their SN4A project giving a gender focus to agriculture and nutrition. The toolkit does this by looking at the gender relations in food production; use of agricultural income; food utilization; access to healthcare; and care practices (Verhart et al. 2016). The toolkit aims to strengthen the ties amongst water and sanitation, nutrition and agriculture interventions (SNV 2016b).

6. LIMITATIONS OF THE MEASUREMENT TOOLS FOR NUTRITION AND GENDER

The measurement tools used by the projects have limitations that can be summarized as follows:

The anthropometric indices are invaluable in providing information on the state of the individual but, like all nutrition-related indicators, they do not provide explanations for underlying causes of malnutrition i.e., if the source of the problem is non-food or food in nature (WHO 1996). Additionally, anthropometric data collection requires well-trained personnel to take the body measurements. An example of effects of training on anthropometry data collection are the recent surveys on child stunting in Zambia where the ZDHS (CSO 2015) showed the levels of stunting reducing to 40% from 46% while the Living Conditions Monitoring Survey (LCMS) (CSO 2016) showed the rates reducing from 50% to 46% over the same period. According to CSO, the DHS employed trained health personnel to collect the data while the LCMS used enumerators who were not necessarily specialized in anthropometric data collection.

For the dietary diversity measurement tools, they have limitations in that there can be potential inconsistency in data collection, incorrect categorization of foods, and omissions of foods. There may be a lack of consensus on amounts that are required to classify food as having been consumed; for example, does a pinch of spice imply a household has consumed a condiment. It should be noted that HDDS is a measure for food access (FANTA 2006) and not micronutrient adequacy. Considerations to be made in the collection of HDDS, MDD-W, and IDDS data as outlined by FANTA (2008) and Kennedy, Ballard, and Dop (2013) are: deciding whether or not foods consumed in very small amounts should be included in the food groups; identifying typical consumption patterns when events (e.g., festive season) occur during data collection; agreeing on the methods to use when grouping mixed dishes; ensuring data is collected for evaluation of a program intervention at the same time of year; and ensuring uniform food grouping classification. Adequate enumerator training is essential, and guidance for this exists.

The key limitations of the GAAP toolkit noted are: the lack of an option for joint ownership in the typology of ownership questions; the lack of standardization in the modules addressing asset ownership and decision making; the difficulty in summarizing data as it becomes more comprehensive; and the lack of recognition of the different subgroups of women in any given population (e.g., widows, female heads of households, wives of heads of households, etc.) whose status may influence asset ownership (Behrman et al. 2014).

Limitations of the WEAI tool are based on the fact that: it focuses on agriculture, thereby women who may otherwise be empowered may be regarded as disempowered because of their non-participation in agricultural activities and it neglects factors that may be of interest outside of agriculture. To assess gender parity, interviews are conducted with male decision makers in households where they exist. This may cause the decision-making domain to inaccurately report women in households that have no male decision maker as empowered. It does not represent the empowerment status of all adult women because those interviewed would most likely be primary decision makers (Malapit et al. 2014). In addition, the perception of empowerment is context specific, with influence from factors such as culture, politics, and the socio-economy, making it difficult to compare from region to region (Alkire et al. 2013).

Updated versions of the WEAI, i.e., WEAI 1.1 and Abbreviated Women's Empowerment in Agriculture Index (A-WEAI), have been formulated, (and may continue to be proposed), to

address the difficulties experienced by previous users in the field, particularly to simplify the questionnaire while still capturing the necessary information (Malapit and Quisumbing 2016).

Despite the limitations acknowledged in these measurement tools, they can play a vital role in the collection of sex-disaggregated data. This can give a more accurate measure of what the impact of an intervention is not only on the household as a whole, but give a clear indication of benefits or constraints experienced by men and women.

Generally, in most of the projects covered in the study, measuring of indicators falls under the monitoring and evaluation unit of the projects. This study found that there is general lack of local ownership and knowledge on impact measuring tools (especially those that are internationally developed) outside of the monitoring and evaluation team in the organization. As a result, there is less understanding of how and what kind of information needs to be collected.

Furthermore, by design, a number of project staff monitor the activities and the outcomes of the activities, while impact monitoring and evaluation is carried out by independent organizations. In as much as this design provides an opportunity for the project's activities to be monitored by an outside organization, it limits the capacity of the project staff to understand and appreciate the collection of monitoring indicators and measuring of impact.

7. REVIEW OF COST EFFECTIVENESS OF DIFFERENT MEASUREMENT TOOLS

Literature shows that inadequate empirical evidence on cost-effectiveness of agricultural interventions continues to be a significant challenge to policy reform and investment (Webb and Kennedy 2014). Nutrition indicators have a big weakness as impact assessment measurement tools in that they are typically time consuming and pose challenges in the scope of disaggregated data that can be collected but they have the advantage of allowing comprehensive assessment of an intervention based on the experiences of an individual beneficiary (Shoham 2001). Some projects may try to limit the number of indicators they use, which may make financial sense, but can result in inadequate measurement of project performance and impacts. There are, however, some guidelines on how to carry out intervention assessments, particularly in developing countries, in a cost effective manner. Surveys should focus on lowering errors and increasing data usefulness to improve cost effectiveness (Scott, Steele, and Temesgen 2003). It is important to note that the cost of using multiple measurement tools or indicators in project assessment or evaluation is small and hence there is no justifiable reason in using a few that compromise the quality of data collected (Maxwell, Coates, and Vaitla 2013).

A study carried out in India by Menon et al. (2016) concluded that the unit costs for measurement tools dealing with micronutrients and de-worming were cheapest in comparison to different types of indicators. The resource requirements for measurement tools typically used in improved nutrition and gender outcomes are summarized in Table 4.

Table 4. Resource Requirements for Data Collection

Measurement Tool	Time Requirements	Training Requirements	Cost
Food Consumption Score	Relatively short	Intensive: particularly for data analysis, previous experience required	Dependent on scale of survey
Household Dietary Diversity Score	10 minutes per respondent	Easy to grasp	Dependent on scale of survey
Household Hunger Scale	3-5 minutes	Easy to grasp, takes about 2 to 3 hours	Dependent on scale of survey
Women Empowerment in Agriculture Index	30 to 40 minutes per household, additional 30 minutes for extra adults	Intensive: measurements being taken are complex	Pilot studies ranged from \$38,000 to \$56,000 per survey
Anthropometric Measurements	Relatively short	Moderate training required to ensure measurements are accurate	Dependent on scale of survey

Source: Authors, based on Scott, Steele, and Temesgen 2003; Maxwell, Coates, and Vaitla 2013; and Menon et al. 2016.

8. OBSERVATION ON MEASUREMENTS FOR ZAMBIA CONTEXT

Three key issues were identified during the course of the study that may influence impact measurement in Zambia.

- i. There is generally use of sub-sections of monitoring measurement tools such as the WEAI as opposed to using all components. This is typically because projects may have a narrow intervention agenda and may regard the complete use of a tool as a waste of resources because the information obtained is not relevant to their overall objectives.
- ii. There is a general lack of local ownership and knowledge on impact measurement tools outside of the monitoring and evaluation team in the organization. Sometimes the projects are actually being evaluated by outside entities (e.g., evaluation teams from outside the project) or data monitoring and evaluation is only assigned to a single person or a few individuals within the organization, not discussed with all team members. Crucial team members, such as program managers, are often unaware of the necessity of collecting quality data or certain types of data. Knowledge about local context is crucial in ensuring an appropriate tool is used in impact assessment. Given the low understanding of some monitoring and evaluation measurement tools, some information on some indicators may not be appropriately collected. In addition, some nutrition deficiencies may be a result of norms and beliefs about consumption of certain types of food. It is important that such information be captured. On the other hand, information may be regarded as sensitive due to cultural norms and selection of measurement tools that require responses on taboo subjects may lead to collection of wrong data as the respondents will not be forthcoming about the information.
- iii. At a national level, there is a need for an overall coordinating body on nutrition and gender interventions. Projects have many different approaches and apply some of the same and some different indicators to measure their impacts, but there is no means to evaluate them in the Zambian context or understand whether they are being applied consistently. This is in order to have a robust monitoring and evaluation framework that is managed by a particular organization and help organizations that are involved in gender and nutrition interventions have a common reference that takes into account project diversity.

9. CHALLENGES FACED BY PROJECTS IN DATA COLLECTION FOR IMPACT MEASUREMENT

A stakeholder workshop was held to validate the findings by the IAPRI team from the projects that were interviewed. The following were the challenges highlighted by the stakeholders in their data collection for impact evaluation of project interventions.

- Some measurement tools are costly: for example, gender indicators, particularly the use of the complete WEAI, are very time intensive and expensive. In addition, focusing on all components of empowerment in a project may be too costly. This is what leads to many projects employing the partial use of measurement tools such as the WEAI.
- Difficulties in obtaining adequate sample size for analysis: for example, where nutrition interventions dealt with children less than two years of age, it was difficult to have a sample size big enough for significant data because of year-to-year variations in the number of children who fall under this category.
- Respondents giving inaccurate information: for example, for information on child feeding, the caregivers typically report what they think they should have fed the child (what they think the enumerator wants to hear) based on *the right thing to do* rather than what the child has actually been fed.
- The stakeholders reported that project staff cannot do the impact evaluation on their own, as they require external evaluators for an objective assessment. This is sometimes the requirement of the donors and, as such, the focus continues to be on activities. Impact is only measured at the activity level, which does not reflect what the project ultimately wants to, or possibly did, achieve. The stakeholders also reported poor coordination between the evaluators and the staff.
- The monitoring and evaluation components of the project are frequently underfunded making quality data collection very difficult. This can impact implementation.

10. CONCLUSION AND RECOMMENDATIONS

The number of projects providing agricultural extension with a focus on gender equity and/or nutrition outcomes has increased in the last five years in Zambia, especially with the implementation the United States Government Feed the Future program. This paper reviews the measurement tools used in Zambia to monitor the impact of agricultural extension on gender equity and nutrition outcomes. The objective of the study was to provide an understanding of the application of the measurement tools and indicators in the Zambian context.

The study found that in Zambia a few projects, mostly the FTF projects, are using measurement tools as they were designed to be used. Many projects are, however, using only parts of measurement tools, even where the tool is supposed to be used in its entirety. Measurement tools that are commonly only partially used are: Women Empowerment in Agriculture Index (WEAI) and Women Asset Ownership. Given the reportedly continued high levels of gender inequality and undernutrition, the existing use of sub-sections to measure the impact of the interventions could be problematic. First, using sub-sections of measurement tools (where the complete tool is intended) makes it difficult to accurately measure the level of equity. Second, the lack of knowledge of the various measurement tools and indicators means that data required to measure the impact of gender equity and nutrition outcomes could be of poor quality.

As a way forward, there is an urgent need to build capacity on nutrition and gender impact measurement tools to enable project staff to not only understand the tools, but to apply them appropriately. In addition, there is a need to develop a general monitoring and evaluation framework for Zambia to guide the use of some indicators specifically designed for measuring the impact of agricultural extension on gender and nutrition outcomes. Finally, coordination of measuring of impact among different organizations with similar interventions should be encouraged. The use of a general monitoring and evaluation framework should be coordinated.

The NFNC, given its coordination role, would be key in facilitating implementation of approved impact indicators.

ANNEXES

ANNEX 1. INDICATORS FOR MONITORING IMPACT OF AGRICULTURAL INTERVENTIONS ON NUTRITION OUTCOMES

Indicator		Organization	Project
1	Prevalence of stunting in children under 5 year	National Food and Nutrition Commission	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
2	Prevalence of underweight children under 5 years	United States Agency for International Development	Feed the Future Projects
3	Prevalence of wasting children under 5 years		
4	Prevalence of Low birthweight (<2.5kg)	National Food and Nutrition Commission	Scaling Up Nutrition: The First 1000 Most Critical Days Program
5	Prevalence of overweight children under 5 years		
6	Prevalence of children 6-23 months receiving a minimum acceptable diet	Catholic Relief Services	Feed The Future Mawa Project
		Concern Worldwide	Realigning Agriculture to Improve Nutrition Project
7	Percentage of children 6 to 23 months who consume at least 5 out of 9 recommended food groups	International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		Food and Agriculture Organization of the United Nations	
		Concern Worldwide	Realigning Agriculture to Improve Nutrition Project
		CARE International	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		CARE International	Nutrition at the Centre

Indicator		Organization	Project
8	Percentage of children 6 to 23 months fed on minimum meal frequency per day	Catholic Relief Services	Feed the Future Mawa project
		International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		CARE International	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		Food and Agriculture Organization of the United Nations	
		Concern Worldwide	Realigning Agriculture to Improve Nutrition Project
		CARE International	Scaling Up Nutrition: The First 1000 Most Critical Days Programme Nutrition at the Centre
9	Percentage of pregnant and lactating women who consume at least 5 out of 9 recommended food groups	International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		Concern Worldwide	Realigning Agriculture to Improve Nutrition Project
		CARE International	Scaling Up Nutrition : The First 1000 Most Critical Days Programme
10	Percentage of pregnant and lactating women with minimum meal frequency	International Institute for Tropical Agriculture	Scaling Up Nutrition : The First 1000 Most Critical Days Programme
		Food and Agriculture Organization of the United Nations	
11	Average months with adequate household food provision	Food and Agriculture Organization of the United Nations	
12	Average number of food groups consumed by households over the reference time	International Institute for Tropical Agriculture	Scaling Up Nutrition : The First 1000 Most Critical Days Programme

Indicator		Organization	Project
		Concern worldwide	Integrating Poverty Reduction and Women Empowerment Program
		CARE International	Nutrition at the Centre
13	Percentage of households that consume at least 5 out of 9 recommended food groups	International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		CARE International	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
			Nutrition at the Centre
14	Percentage of households with minimum meal frequency	International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		CARE International	Nutrition at the Centre
15	Percentage of households producing diverse micronutrient rich plants and animal foods.	International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
16	Percentage of women 15 to 45 years of age who consume at least 5 out of 9 recommended food groups.	International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		Concern Worldwide	Realigning Agriculture to Improve Nutrition Project
		CARE International	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
			Nutrition at the Centre
17	Percentage of women in child bearing age trained in food processing, storage and preservation.	International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		Programme Against Malnutrition	Empowering Women through Agricultural Support
18	Percentage of people reached with nutrition messages (Information Education Communication (IEC) and Behaviour Change Communication (BCC))	Heifer International	Integrated Livelihoods Agribusiness Support Project
		Concern Worldwide	Integrated Poverty Reduction and Women Empowerment Program

Indicator		Organization	Project
		Stichting Nederlandse Vrijwilligers	Sustainable Nutrition for All
		World Food Programme	Scaling Up Nutrition Mumbwa Project
		International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		Production, Finance, and Improved Technology Plus	Feed The Future
		CARE International	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
19	Percentage of women in child bearing age reached with nutrition messages.	Heifer International	
		World Food Programme	Scaling Up Nutrition Mumbwa Project
		Concern Worldwide	
		International Institute for Tropical Agriculture	
20	Percentage of people adopting new behaviours and practices to prevent stunting	World Food Programme	Scaling Up Nutrition Mumbwa Project
		CARE International	Nutrition at the Centre
			Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		Catholic Relief Services	Mawa project
Concern Worldwide	Realigning Agriculture to Improve Nutrition Project		
21	Percentage of households adopting the approach to consume produce while keeping excess for income.	Programme Against Malnutrition	Empowering Women through Agricultural Support

Indicator		Organization	Project
22	Percentage of households with increased crop production	World Food Programme	Promotion of complementary feeding using locally produced indigenous nutritious foods Agriculture & Income
		International Development Enterprise	Small-Holder Agriculture Reform through Enterprise Development project
23	Percentage of households in animal rearing with increased animal production	Programme Against Malnutrition	
		Heifer International	Enhanced Livestock Trade and Enterprise Project
24	Percentage of farmers with increased income from sale of agriculture commodities	Catholic Relief Services	Feed The Future Mawa project
		International Development Enterprise	Small-Holder Agriculture Reform through Enterprise Development project
		International Institute for Tropical Agriculture	Integrated Soil Fertility Management Project
25	Percentage of farmers applying innovations to reduce risks for production failure.	Catholic Relief Services	Feed The Future Mawa project
		Food and Agriculture Organization of the United Nations	Conservation Agriculture Scaling-Up
		Programme Against Malnutrition	Empowering Women through Agricultural Support
26	Percentage of households engaged in production of variety crops, livestock, forestry, fisheries & aquaculture using improved agronomic practices.	Catholic Relief Services	Feed The Future Mawa project
		Programme Against Malnutrition	Empowering Women through Agricultural Support
			Enhanced Livestock, Trade and Enterprise

Indicator		Organization	Project
		Heifer International	Integrated Livelihoods and Agribusiness Support Project
27	Percentage of people trained in food processing, preservation and storage.	Programme Against Malnutrition	Empowering Women through Agricultural Support
		Catholic Relief Services	Feed the Future Mawa project
		CARE International	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
28	Percentage of nutrition support groups trained in food processing, preservation and storage.	Programme Against Malnutrition	Empowering Women through Agricultural Support
		Catholic Relief Services	Feed The Future Mawa
29	Percentage of farmers trained in post-harvest handling technology and storage	Food and Agriculture Organization of the United Nations	Conservation Agriculture Scaling Up
		Production, Finance, and Improved Technology Plus	Feed The Future
		Programme Against Malnutrition	Empowering Women through Agricultural Support
		Catholic Relief Services	Feed The Future Mawa project
30	Percentage of people applying value-addition activities to their harvested crops.	Catholic Relief Services	Feed The Future Mawa project
		International Development Enterprise	Small-Holder Agriculture Reform through Enterprise Development Project
		Production, Finance, and Improved Technology Plus	Feed The Future
		Programme Against Malnutrition	Empowering Women through Agricultural Support
		Ministry of Agriculture	Agriculture Productivity Market Enhancement Project
		Concern Worldwide	Agriculture and Nutrition for Health
		Food and Agriculture	Conservation Agriculture Scaling Up

Indicator		Organization	Project
		Organization of the United Nations	
31	Percentage of people practicing recommended food storage techniques for their agriculture products.	Food and Agriculture Organization of the United Nations	Conservation Agriculture Scaling Up
		Programme Against Malnutrition	Empowering Women through Agricultural Support
		Concern Worldwide	Realigning Agriculture to Improve Nutrition Project
		Catholic Relief Services	Feed The Future Mawa project

ANNEX 2. INDICATORS FOR MONITORING IMPACT OF AGRICULTURAL INTERVENTIONS ON GENDER EQUITY

Indicator		Organizations with Projects Collecting This Data	Projects Collecting This Data
1	Proportion of women with a letter of offer for land ownership from local authority (Chief)	Programme Against Malnutrition	Empowering Women through Agricultural Support
2	Proportion of women with access to land	Heifer International	
3	Equitable ownership of household productive assets	Production, Finance, and Improved Technology Plus	
4	Proportion of women with power to decide on purchase, sale or transfer of assets	Production, Finance, and Improved Technology Plus	Smallholder Farmers Agency and leadership in Rural livelihoods
5	Proportion of women with equitable control over family resources	Heifer International	Smallholder Farmers Agency and Leadership in Rural livelihoods
		Production, Finance, and Improved Technology Plus	Feed The Future
		Programme Against Malnutrition	Empowering Women through Agricultural Support
6	Proportion of women holding leadership positions in community groups	Heifer International	Enhanced Livestock Trade and Enterprise Project
		Programme Against Malnutrition	Empowering Women through Agricultural Support
		Production, Finance, and Improved Technology Plus	Feed The Future
7	Women's groups formed and received leadership training	Concern Worldwide	Realigning Agriculture to Improve Nutrition Plus
8	Proportion of women with comfort speaking in public	Concern Worldwide	Realigning Agriculture to Improve Nutrition Plus
9	Proportion of women with decision making power on which crops to grow	Heifer Zambia	Smallholder Farmers Agency and Leadership in Rural livelihoods
		Programme Against Malnutrition	Empowering Women through

Indicator		Organizations with Projects Collecting This Data	Projects Collecting This Data
			Agricultural Support
10	Proportion of women with decision making power on quantity of produce to consume and quantity for sale	Programme Against Malnutrition	Empowering Women through Agricultural Support
11	Proportion of women who can make decision on and have access to credit	Heifer Zambia	
		Production, Finance, and Improved Technology Plus	
12	Women's autonomy index	Concern Worldwide	Realigning Agriculture to Improve Nutrition Plus
13	Proportion of women with access to health	Heifer International	Smallholder Farmers Agency and Leadership in Rural livelihoods
14	Percentage of women with decision making power over their reproductive health	Heifer International	Smallholder Farmers Agency and Leadership in Rural livelihoods
15	Proportion of women with access to communication & technology (ICT)	Heifer International	Smallholder Farmers Agency and Leadership in Rural livelihoods
16	Percentage of women with decision making power over their reproductive health (including family planning)	Heifer International	Smallholder Farmers Agency and Leadership in Rural livelihoods
17	Proportion of women carrying out time consuming activities in production	Production, Finance, and Improved Technology Plus	Feed The Future
18	Proportion of women with adequate leisure time	Production, Finance, and Improved Technology Plus	Feed The Future
19	Proportion of women not experiencing drudgery	Heifer International	Smallholder Farmers Agency and Leadership in Rural livelihoods
20	Percentage of women with decision making power over their reproductive health (including family planning)	Heifer International	
21	Quantity of product sold by female farmers per quarter	Programme Against Malnutrition	Empowering Women through Agricultural Support
22	Proportion of women in charge of selling agricultural produce (including meat, eggs, milks and/or field crops)	Concern Worldwide	Realigning Agriculture to Improve Nutrition Plus

Indicator		Organizations with Projects Collecting This Data	Projects Collecting This Data
23	Proportion of women producing diverse and micronutrient-rich foods	Programme Against Malnutrition	Empowering Women through Agricultural Support
		International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
		Concern Worldwide	Realigning Agriculture to Improve Nutrition Plus
24	Proportion of women trained in food processing, preservation and storage	Programme Against Malnutrition	Empowering Women through Agricultural Support
25	Proportion of women with increased returns due to strengthened market linkages	International Development Enterprise	Small-Holder Agriculture Reform through Enterprise Development
26	Proportion of women with access to improved seed	International Institute for Tropical Agriculture	Scaling Up Nutrition: The First 1000 Most Critical Days Programme
27	Proportion of women with increased income from agriculture	Stichting Nederlandse Vrijwilligers	Sustainable Nutrition for All
28	Proportion of women trained in latest research and technology in production	Programme Against Malnutrition	Empowering Women through Agricultural Support
29	Proportion of women & men that perceive women shouldn't be responsible for the supervision of work	Concern Worldwide	Realigning Agriculture to Improve Nutrition Plus
30	% of women & men that believe a powerful woman won't respect her husband	Concern Worldwide	Realigning Agriculture to Improve Nutrition Plus

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